



Magnesium Elektron

SERVICE & INNOVATION IN MAGNESIUM

Elektron WE43B

A corrosion resistant magnesium casting
alloy for use up to 570°F

Datasheet : 467A

Magnesium Elektron North America Inc. (Powders and Alloys)
Reade Manufacturing Company, 100 Ridgeway Boulevard,
Manchester, NJ 08759. Tel: 732-657-6451. Fax: 732-657-6628

Magnesium Elektron North America Inc. (Powders and Alloys)
Regional Office: 100 E. Taylor Street, Suite 4, Creston IA 50801.
Tel: 641-782-7200. Fax: 641-782-7929
www.magnesium-elektron.com

Elektron WE43B

ELEKTRON WE43B is a high strength magnesium casting alloy developed in England and patented by Magnesium Elektron for use at temperatures up to 570°F. This alloy system maintains its high mechanical properties at elevated temperatures, without the use of either silver or thorium. The alloy is stable for long-term exposure up to 480°F. ELEKTRON WE43B has excellent corrosion resistance characteristics. When specified to AMS 4427A, the alloy achieves a corrosion rate of less than 75mpy (mils per year) as tested under ASTM B117 salt fog conditions.

APPLICATIONS

The excellent retention of properties at elevated temperatures will be of interest to designers of aeroengines and other power systems, helicopter transmissions, missiles, racing and high performance cars.

SPECIFICATIONS

UNS No. 18432
ASTM B80
AMS 4427A
AECMA MG-C96002

CHEMICAL COMPOSITION

Yttrium	3.7–4.3%
Neodymium	2.0–2.5%
Other Rare Earths*	1.9% Max
Zirconium	0.4% min
Magnesium	Balance

Trace elements controlled to improve corrosion performance.

*Other Rare Earths shall be principally Heavy Rare Earths (e.g. Gadolinium, Dysprosium, Erbium, Ytterbium). Heavy Rare Earth fraction is directly related to the Yttrium content of the alloy (typically 80% Yttrium, 20% Other Rare Earths).

HEAT TREATMENT

Solution heat treat for 8 hours at 975°F.

Forced air cool preferred.

Age for 16 hours at 480°F.

PHYSICAL PROPERTIES

Specific gravity	1.84
Solidus temp.	1000–1020°F
Liquidus temp.	1185°F
Electrical resistivity	14.8 x 10 ⁻⁶ ohm cm
Specific heat	0.23 Btu lb ⁻¹ °F ⁻¹
Coefficient of thermal expansion	14.8 x 10 ⁻⁶ °F ⁻¹
Youngs modulus	6400 ksi
Poissons ratio	0.27
Thermal conductivity (70°F)	29.6 Btu ft ⁻¹ h ⁻¹ °F ⁻¹
Thermal conductivity (210°F)	34.6 Btu ft ⁻¹ h ⁻¹ °F ⁻¹
Brinell hardness	Min. 75 Max. 95

OTHER PROPERTIES

CASTABILITY

Fine grained with good casting characteristics. Pressure tight.

PATTERN MAKERS SHRINKAGE FACTOR

1.5%

WELDABILITY

Fully weldable by the inert gas tungsten arc (TIG) process, using filler rods of parent alloy composition.

MACHINING

WE43B castings, like all magnesium alloy castings, machine faster than any other metal. Providing the geometry of the part allows, the limiting factor is the power and speed of the machine rather than the quality of the tool material. The power required per cubic inch of metal removed varies from 150 watts to 225 watts per minute depending on the operation.

SURFACE TREATMENT

Normal protective treatments apply for WE43B but some chromating baths may need to be modified for the satisfactory treatment of castings. Please refer to MEL Data Sheet 206. Please refer to the ELEKTRON Surface Treatment Booklet for further details on protection schemes and steps to be taken to avoid galvanic corrosion.

CORROSION RESISTANCE

Additions of Yttrium contribute to the excellent corrosion resistance characteristics of ELEKTRON WE43B to the extent that they are of a similar order to aluminum-base casting alloys under the extremely aggressive salt spray test conditions.

ASTM B117 salt fog test
Corrosion rate typically 25mpy
3% NaCl immersion test
Corrosion rate typically 20mpy

AMBIENT TEMPERATURE MECHANICAL PROPERTIES

AMS 4427A SPECIFICATION TENSILE PROPERTIES

0.2% Yield strength	25.0 ksi
Tensile strength	32.0 ksi
Elongation	2%

Minimum properties in separately cast test bars (sand cast) (70°F).

TYPICAL TENSILE PROPERTIES AT 70°F

0.2% Yield strength	26.0 ksi
Tensile strength	36.3 ksi
Elongation	6%

Cut from casting data

TYPICAL COMPRESSIVE PROPERTIES

0.2% Yield strength	27.1 ksi
Ultimate strength	46.8 ksi

TYPICAL SHEAR PROPERTIES

Ultimate stress	23.5 ksi
-----------------	----------

FRACTURE TOUGHNESS

K_{IQ}	13.0 - 13.7 ksi in ^{1/2}
----------	-----------------------------------

TYPICAL FATIGUE PROPERTIES ksi

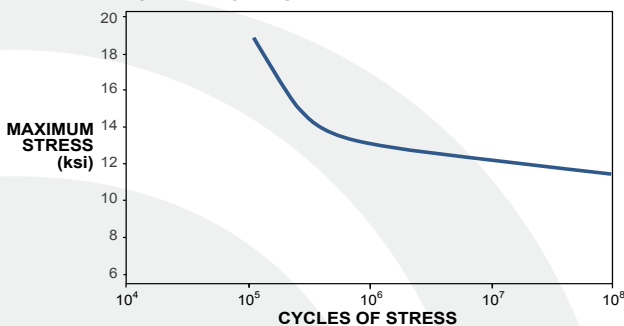
ROTATING BENDING

STRESS REVERSALS

10^6	5×10^6	10^7	5×10^7
13.1	12.6	12.5	12.3

FATIGUE PROPERTIES

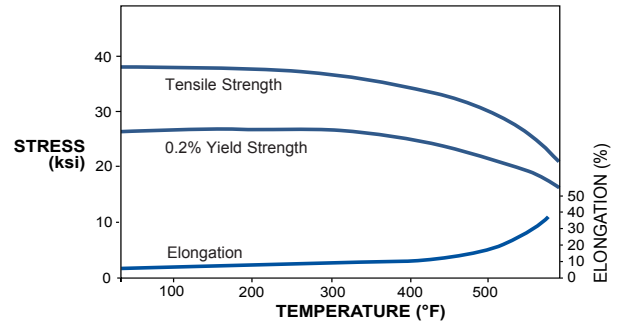
FIG. 1 Rotating bending fatigue test



ELEVATED TEMPERATURE MECHANICAL PROPERTIES

TYPICAL TENSILE PROPERTIES

FIG. 2 Effect of temperature on tensile properties



CREEP PROPERTIES

FIG. 3 Stress/time relationship for specified creep strains at 390°F

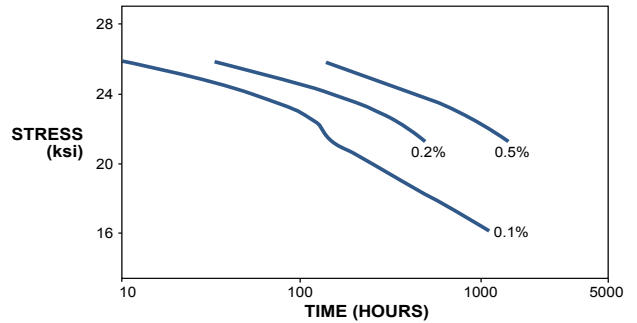
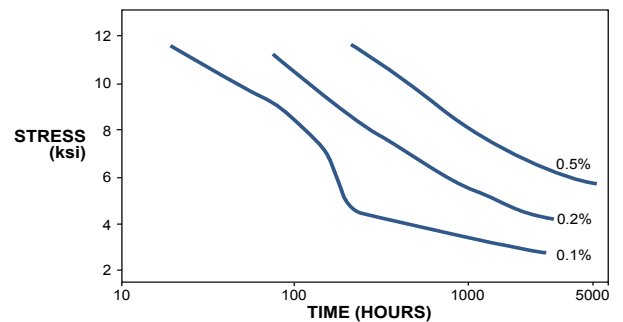
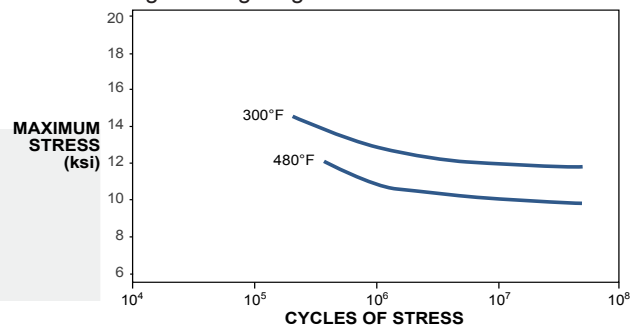


FIG. 4 Stress/time relationship for specified creep strains at 480°F



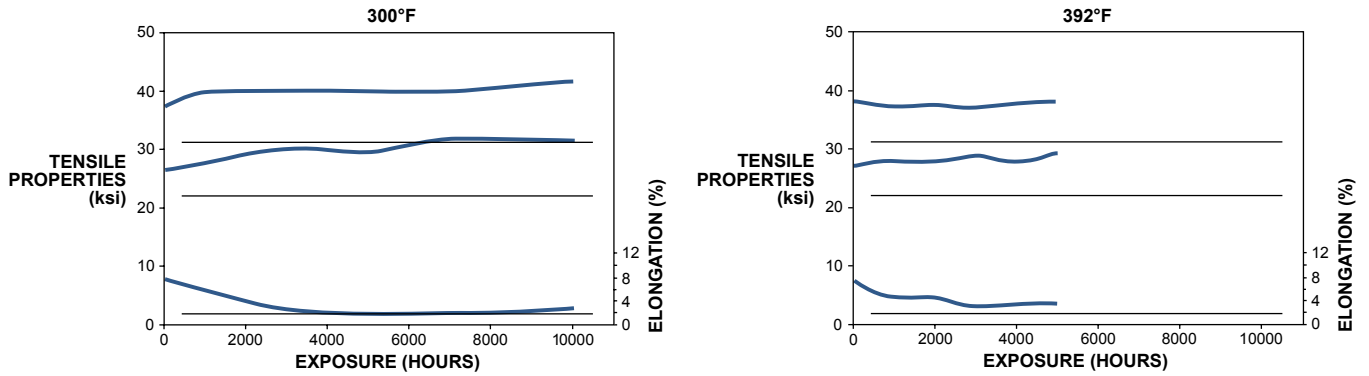
FATIGUE PROPERTIES

FIG. 5 Rotating bending fatigue test



Elektron WE43B

AMBIENT TEMPERATURE PROPERTIES OF WE43-T6 AFTER LONG TERM EXPOSURE AT ELEVATED TEMPERATURE



CUT UP PROPERTIES OF SAMPLES TAKEN FROM ACTUAL CASTINGS

Temperature	Number of Tests	0.2% Yield Strength (Ksi)	Tensile Strength (Ksi)	Elongation (%)
68°F	215	Minimum	21.6	2
		Average	25.8	7
		Maximum	31.2	17
482°F (short time)	56	Minimum	19.4	2
		Average	22.5	18
		Maximum	28.0	36



Certificate No. FM12677